

# Cloud discrimination for ASCENDS Mission Based on Optical Phase Conjugation as a Novel Approach, Phase I

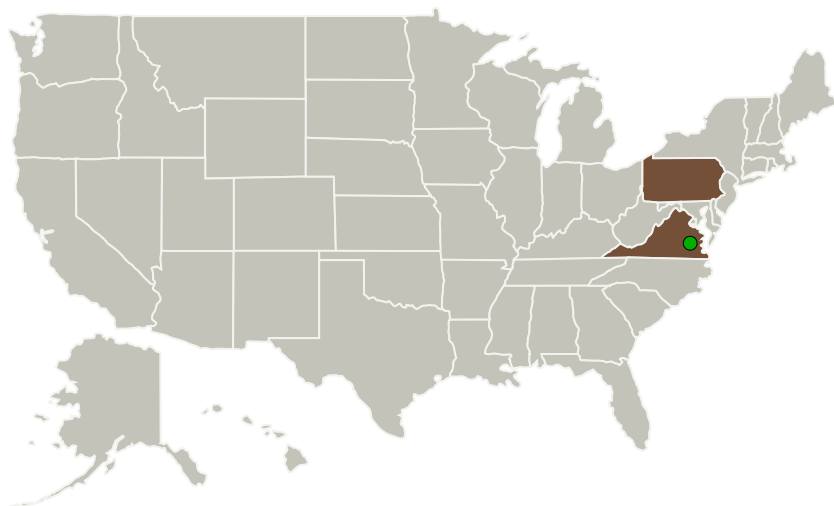
Completed Technology Project (2011 - 2011)



## Project Introduction

PI at ArkLight proposes a novel scheme for making cloud discrimination in the wavelength ranges of near-IR (1-1.8  $\mu\text{m}$ ) and mid-IR (3-4  $\mu\text{m}$ ). This scheme is based on optical phase conjugation from a second-order nonlinear medium. It overcomes the disadvantages of slow speed in photorefractive media and poor reflectivities in third-order nonlinear materials. During Phase 1, she will design novel phase-conjugate mirrors operating at the signal wavelengths of 1.27  $\mu\text{m}$  and 1.57  $\mu\text{m}$ . Subsequently, she will fabricate the designed phase-conjugate devices. The next step will be testing of the fabricated devices by investigating sum-frequency and difference-frequency generation in the transverse geometry. She will also carry out modeling efforts on the device performances for making cloud discrimination. This Phase 1 project will be carried out in collaboration with Prof. Ding at Lehigh University who is one of the pioneers in optical phase conjugation. The anticipated results for Phase 2 include implementation and testing of the phase-conjugate mirrors operating at 1.27  $\mu\text{m}$  and 1.57  $\mu\text{m}$  for correcting phase distortion and making cloud discrimination, optimization of the phase-conjugate mirrors, finding solutions to practical issues for deploying these mirrors in the ASCENDS mission, expansion of input wavelengths, incorporation with frequency up-conversion devices, and reports.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ArkLight	Lead Organization	Industry	Center Valley, Pennsylvania
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Pennsylvania	Virginia

## Project Transitions

**February 2011:** Project Start

**September 2011:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138034>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

ArkLight

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

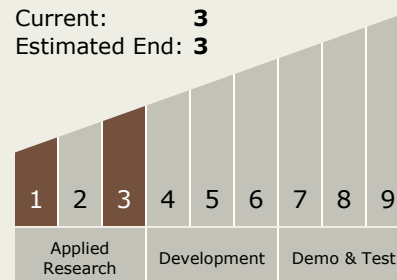
Carlos Torrez

### Principal Investigator:

Yuliya B Zotova

## Technology Maturity (TRL)

Start: **1**  
Current: **3**  
Estimated End: **3**



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## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.2 Observatories
    - └ TX08.2.1 Mirror Systems

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System